

\* In Class

Pyramid Scam

Name Key

Date \_\_\_\_\_

$a_1 = 1$  chain  
 $r = 10$  letter

Chapter 8 Geometric Sequence word problems

$a_6 = 1 \cdot 10^5$   
100,000

$a_8 = 10,000,000$



1. A manufacturer of artificial greenery is considering a new model tree with 4 limbs. Each limb holds four branches, each branch holds four twigs, and each twig holds four leaves. How many leaves will the new model tree require?

L → B → T → L

$a_1 = 4$   
 $r = 4$   
 $a_4 = 4(4)^3$   
256 leaves



2. At a telephone switching station the first level of a circuit has 3 lines. At a second level, each of the lines branches into 5 lines, at the third level, each of the lines branches into 5 lines, and so on. How many lines emerge from the fifth level?

$a_1 = 3$   
 $r = 5$   
 $a_5 = 3 \cdot 5^4$   
1875 lines

Weeks 4 6 8

$a_2$   $a_3$   $a_4$   $a_5$



3. A population of insects being observed in an experiment grows by 10% every two weeks. In other words, at the end of two weeks there will be 1.1 times the original number of insects. If there are 10,000 insects at the beginning of the experiment, how many will there be at the end of eight weeks?

$a_1 = 10,000$   
 $a_5 = 10,000(1.1)^4$   
14,641 insects

$S_5 = \frac{10,000 - 1.1(14,641)}{1 - 1.1}$   
61,057

4. Each year the value of a certain car is 70% of what it was the previous year. If its value was \$5000 at the end of the first year, what was it at the end of the fifth year?

$a_1 = 5000$   
 $r = .7$   
 $a_5 = 5000(.7)^4$   
1200.50

5. A legendary coin bank has the power of doubling the amount of money in it in each day. If \$0.01 is deposited in it on January 1<sup>st</sup>, how much will be in the bank on January 31<sup>st</sup>?

$a_1 = .01$   
 $r = 2$   
 $a_{31} = .01(2)^{30}$   
\$10,737,418.24

$$S_n = \frac{n}{2} [2a_1 + (n-1)d]$$

$$S_n = \frac{a_1 - a_1 r^n}{1 - r}$$

$$a_n = a_1 r^{n-1}$$

$$S_n = \frac{n}{2} (a_1 + a_n)$$

$$S_n = \frac{a_1 - r a_n}{1 - r}$$

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### Series Word Problems

$$a_1 = 2$$

1. Kurt can trace his ancestors back through 10 generations. He counts his parents as the first generation back, his four grandparents as the second generation back, and so on. How many ancestors does he have in these 10 generations?

$$S_{10} = \frac{2 \cdot 2^{11}}{1 - 2} = 2046$$

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2. You have won a contest sponsored by a local radio station. If you are given the choice of the two payment plans listed below, which plan will pay you more?

a. Plan A: \$1 on the first day, \$2 on the second day, \$3 on the third day, and so on for two weeks.

b. Plan B: \$.01 on the first day, \$.02 on the second day, \$.04 on the third day, and so on for two weeks.

$$a. S_n = \frac{14}{2} [2(1) + 13 \cdot 1]$$

$$7 \cdot 15 = 105$$

$$b. S_{14} = \frac{.01 - .01(2)^{14}}{1 - 2}$$

$$\$163.83$$

3. Refer to problem 2, find out how much each plan would pay you if they extended over 3 weeks.

$$S_{21} = \frac{21}{2} [2(1) + 20 \cdot 1]$$

$$\frac{21}{2} \cdot 22$$

$$\$231$$

$$S_{21} = \frac{.01 - .01(2)^{21}}{1 - 2}$$

$$\$20,971.51$$

4. Which of the two jobs listed below will pay you a higher salary during the fifth year of employment? Which will pay you a greater total amount for all five years?

a. Job A: Make \$20,000 the first year with annual raises of \$1500.

b. Job B: Make \$18,000 the first year with annual raises of 10%.

$$A. S_5 = 20,000 + 4(1500)$$

$$26,000$$

$$B. S_5 = 18,000(1.10)^4$$

$$\$26,353.50$$

$$A. S_5 = \frac{20,000 - 26,000}{1 - 1.10}$$

$$\$115,000$$

$$B. S_5 = \frac{18,000 - 18,000(1.10)^5}{1 - 1.10} = \$109,891.80$$

5. Refer to problem 4, which job will pay you a greater total amount over a ten year period? How much more?

$$S_{10} = \frac{10}{2} [2(20,000) + 9 \cdot 1500]$$

$$= \$267,500$$

$$S_{10} = \frac{18,000 - 18,000(1.10)^{10}}{1 - 1.10}$$

$$286,873.64$$

6. After the accelerator pedal of a car is released, the driver waits 5s before applying the brakes. During each second after the first, the car rolls 0.9 times the distance it rolled during the preceding second. If the car went 20m during the first second, how far does it go before the brakes are applied?

$$a_1 = 20$$

$$r = .9$$

$$S_5 = \frac{20 - 20(.9)^5}{1 - .9} = 81.902 \text{ m}$$

7. A maple tree loses 384 leaves during the first week of fall and  $\frac{3}{2}$  as many each successive week. At the end of 7 weeks all the leaves have fallen. How many leaves fell from the tree?

$$a_1 = 384$$

$$r = \frac{3}{2}$$

$$S_7 = \frac{384 - 384(\frac{3}{2})^7}{1 - \frac{3}{2}}$$

$$S_7 = 12,354 \text{ (leaves)}$$